

Appl. No. 10/766,532
Amdt. Dated January 5, 2007
Reply to Office Action of September 6, 2006

Attorney Docket No. 81880.0113
Customer No.: 26021

REMARKS/ARGUMENTS:

Claims 2-4, 8-11, 13, 14, 16, 17, 19, and 20 are canceled without prejudice. Claims 1 and 7 are amended. Support for the amendment to claim 1 can be found in original claims 1-4 and from the data from Samples 42-45 and 48-51 in Table 3 at p. 28 of Applicant's specification. New claims 21-24 are added. Claims 1, 5-7, 12, 15, 18, and 21-24 are pending in the application. Reexamination and reconsideration of the application, as amended, are respectfully requested.

The present invention relates to an electrostatic chuck which is used in an apparatus for manufacturing semiconductor devices or liquid crystal devices and mounts thereon a wafer such as a semiconductor wafer and a liquid crystal glass substrate. (Applicant's specification, at p. 1, lines 7-11).

CLAIM REJECTIONS UNDER 35 U.S.C. § 103:

Claims 1, 4-6, 12, 14, 18, and 20 stand rejected under 35 § 103(a) as being unpatentable over Weldon et al. (U.S. Patent No. 6,108,189) in view of Johnson et al. (U.S. Patent No. 6,740,853) and Ross et al. (U.S. Patent No. 5,986,874). This rejection is moot with respect to claims 4, 14, and 20 due to the cancellation of these claims. The Applicant respectfully traverses this rejection as to claims 1, 5, 6, 12, and 18. Claim 1, as amended, is as follows:

An electrostatic chuck comprising:
a circular ceramic plate having an electrostatic attractive electrode;
a mounting surface for supporting a wafer formed on one of the main surfaces of the circular ceramic plate;
an annular gas groove formed on the periphery of the mounting surface in the form of concentric circles and a first gas inlet which communicates with the annular gas groove; and

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a circular gas recess formed inside the circular ceramic plate,
and a second gas inlet which communicates with the circular gas
recess,

wherein the annular gas groove and the circular gas recess are
independently separated from each other by a first annular rib
protrusion,

wherein a plurality of dotted protrusions are disposed within
both the annular gas groove and the circular gas recess,

wherein the circular gas recess has a diameter which is set to
70 to 95% of the outer diameter of the mounting surface,

wherein the first annular rib protrusion surrounded by the outer
circumference of the circular gas recess and the inner circumference of
the annular gas groove has a width in a range of 0.5 to 5 mm, and a
second annular rib protrusion surrounded by the outer circumference
of the mounting surface and the outer circumference of the annular gas
groove has a width in a range of 1 to 5 mm,

wherein the ratio $S1/S2$ of the area $S1$ of the circular gas recess
to a total area $S2$ of the upper surfaces of the dotted protrusions
disposed inside the circular gas recess is set in a range of 1 to 5; and

the ratio $S3/S4$ of an area $S3$ of the annular gas groove to a total
area $S4$ of the upper surfaces of the dotted protrusions formed inside
the annular gas groove is set in a range of 1 to 5.

Applicant respectfully submits that the cited references cannot render
amended claim 1 obvious, because the cited references fail to teach or suggest the
combination of "an annular gas groove formed on the periphery of the mounting
surface in the form of concentric circles and a first gas inlet which communicates

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with the annular gas groove; and a circular gas recess formed inside the circular ceramic plate, and a second gas inlet which communicates with the circular gas recess" and "wherein a plurality of dotted protrusions are disposed within both the annular gas groove and the circular gas recess, wherein the circular gas recess has a diameter which is set to 70 to 95% of the outer diameter of the mounting surface, wherein the first annular rib protrusion surrounded by the outer circumference of the circular gas recess and the inner circumference of the annular gas groove has a width in a range of 0.5 to 5 mm, and a second annular rib protrusion surrounded by the outer circumference of the mounting surface and the outer circumference of the annular gas groove has a width in a range of 1 to 5 mm, wherein the ratio $S1/S2$ of the area $S1$ of the circular gas recess to a total area $S2$ of the upper surfaces of the dotted protrusions disposed inside the circular gas recess is set in a range of 1 to 5; and the ratio $S3/S4$ of an area $S3$ of the annular gas groove to a total area $S4$ of the upper surfaces of the dotted protrusions formed inside the annular gas groove is set in a range of 1 to 5."

It is an aspect of the present invention that the above combination prevents the temperature difference on the wafer surface from being more than 1.5°C and keeps the time for attaining a saturated temperature from being more than 4 seconds. (Applicant's specification, at p. 28, lines 12-17; Table 3). It is the above combination that allows for effectively controlling the circumference zone temperature of the wafer.

Weldon is directed to an electrostatic chuck useful for holding a substrate in a high density plasma. (Weldon, ABSTRACT). Johnson is directed to a substrate holder for holding a substrate during plasma processing. (Johnson, ABSTRACT). Neither Weldon nor Johnson teach or suggest an electrostatic chuck wherein a plurality of dotted protrusions is disposed within both the annular gas groove and

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the circular gas recess, much less an electrostatic chuck with all of the required dimensions listed above; and neither reference is relied upon by the Office for such.

Instead, the Office cites Ross for teaching the usage of dotted protrusions (Fig. 5-6 elements 48) and states that it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Weldon in view of Johnson device with the teachings of Ross because using numerous, relatively small raised areas allows the cooling gas to be quickly and evenly distributed across the underside of the wafer.

The Applicant respectfully disagrees. The dotted protrusions in Ross are found in the circular gas recess and not in the annular groove. In Ross, there are no dotted protrusions in anything that represents an annular groove. In the present invention, the number of dotted protrusions 12 are distributed within the region of the annular groove 9, which efficiently prevents deformation of the wafer. (Applicant's specification, at p. 12, lines 12-15). In addition, the protrusions help to minimize the temperature differences within the wafer as shown in Table 1 of Applicant's specification. Hence, Ross does not offer the benefits of the present invention.

Also, Weldon already describes heat transfer gas flow conduits to produce uniform heating and cooling. (Weldon, column 8, lines 28-48). Consequently, there would be no motivation to combine the teaching of Weldon with the teaching of Ross.

Furthermore, none of the cited references provide a means for effectively controlling the circumference zone temperature of the wafer, as discussed above.

Therefore, Applicant respectfully submits that absent impermissible hindsight reasoning gleaned from the present application, there is nothing in the

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cited references that suggests the desirability of such a combination. Furthermore, combining the references would not yield the present invention.

In light of the foregoing, Applicant respectfully submits that the cited references could not have rendered claim 1 obvious, because the cited references fail to teach or suggest each and every claim limitation. Claims 5, 6, 12, and 18 depend from claim 1 and cannot be rendered obvious for at least the same reasons as claim 1. Withdrawal of this rejection is thus respectfully requested.

Claims 2, 7, 10, and 19 stand rejected under 35 § 103(a) as being unpatentable over Weldon, Johnson, Ross, and Lue et al. (U.S. Patent No. 5,761,023). This rejection is moot with respect to claims 2, 10, and 19 due to the cancellation of these claims. The Applicant respectfully traverses this rejection as to claim 7.

Claim 7 depends from claim 1 and is therefore, patentable over Weldon, Johnson, and Ross for the reasons discussed above. Lue cannot remedy the defect of Weldon, Johnson, and Ross and is not relied upon by the Office for such. Instead, the Office cites Lue for teaching the circular gas recess has a diameter, which is set to 70 to 95% of the outer diameter of the mounting surface. However, Lue fails to teach the other required dimensions of the present invention. Specifically, Lue fails to teach or suggest that "the first annular rib protrusion surrounded by the outer circumference of the circular gas recess and the inner circumference of the annular gas groove has a width in a range of 0.5 to 5 mm, and a second annular rib protrusion surrounded by the outer circumference of the mounting surface and the outer circumference of the annular gas groove has a width in a range of 1 to 5 mm, wherein the ratio $S1/S2$ of the area $S1$ of the circular gas recess to a total area $S2$ of the upper surfaces of the dotted protrusions disposed inside the circular gas recess is set in a range of 1 to 5; and the ratio $S3/S4$ of an area $S3$ of the annular gas

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groove to a total area S4 of the upper surfaces of the dotted protrusions formed inside the annular gas groove is set in a range of 1 to 5." Thus, Lue fails to teach or suggest a means for effectively controlling the circumference zone temperature of the wafer, as taught by the present invention.

In light of the foregoing, Applicant respectfully submits that the cited references could not have rendered claim 7 obvious, because the cited references fail to teach or suggest each and every claim limitation. Withdrawal of this rejection is thus respectfully requested.

Claims 3, 9, 11, 13, 15, and 17 stand rejected under 35 § 103(a) as being unpatentable over Weldon, Johnson, Ross, and del Puerto et al. (U.S. Patent No. 5,186,238). This rejection is moot with respect to claims 3, 9, 11, 13, and 17 due to the cancellation of these claims. The Applicant respectfully traverses this rejection as to claim 15.

Claim 15 depends from claim 1 and is therefore, patentable over Weldon, Johnson, and Ross for the reasons discussed above. Del Puerto cannot remedy the defect of Weldon, Johnson, and Ross and is not relied upon by the Office for such. Instead, the Office cites del Puerto for teaching a depth/width/pitch of 1/1.2/4.

In light of the foregoing, Applicant respectfully submits that the cited references could not have rendered claim 15 obvious, because the cited references fail to teach or suggest each and every claim limitation. Withdrawal of this rejection is thus respectfully requested.

Claims 8 and 16 stand rejected under 35 § 103(a) as being unpatentable over Weldon, Johnson, Ross, Lue, and del Puerto. This rejection is moot due to the cancellation of these claims.

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In view of the foregoing, it is respectfully submitted that the application is in condition for allowance. Reexamination and reconsideration of the application, as amended, are requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles, California telephone number (310) 785-4600 to discuss the steps necessary for placing the application in condition for allowance.

If there are any fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-1314.

Respectfully submitted,
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